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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/892,603	06/28/2001	Yoshihiko Toyoda	401265	4828

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EXAMINER

ANDUJAR, LEONARDO

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 12/13/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/892,603

Applicant(s)

TOYODA, YOSHIHIKO

Examiner

Leonardo Andújar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 6-12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: _____

DETAILED ACTION

Acknowledgment

1. The pre amendment filed on 06/28/2002, paper no. 3 has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 1-12.

Election/Restrictions

2. Applicant's election of Group species 1, which encompass generic claim 1 and dependent claims 2-5, and in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Japan on 01/1/2001. The certified copy of the priority document has been received.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Jeong (US 5,960,317).

6. Regarding claim 1, Jeong (e.g. fig. 3c) shows a semiconductor device comprising an insulating layer (57 and 59a) having a surface and including a plurality of grooves (e.g. 58) having different widths and a conductive layer 63a filling each of the grooves and including a plated layer 61a. Also, Jeong shows that a bottom portion of the groove 58 is non planar.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong (US 5,960,317) in view of Jeng et al. (US 5,893,734).

9. Regarding claim 2, Jeong shows most aspects of the instant invention including a non-planar bottom surface having an aspect ratio (i.e. depth to width ratio). Jeong does not disclose the specific the depth to width ratio. Jeng discloses that the aspect ratio of electrical interconnections is subject to optimization. According to Jeng, high aspect ratios make more difficult the size reduction of semiconductor devices. Therefore, it is desirable to minimize the aspect ratios of the multilevel contacts holes during the

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downscaling of the minimum feature sizes of the devices (col. 1/lls. 9-67 and col. 2/lls. 1-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize the depth to width ratio and/or to optimize the aspect ratio of the grooves disclosed by Jeong in order to effectively reduce the overall device size as suggested by Jeng. With regards to the specific aspect ratio claimed by applicant, i.e., a ratio of depth to width of not more than 0.7, is only considered to be the "optimum" depth to width ratio of the opening disclosed by the Prior Art that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, size reduction, manufacturing costs, etc. (see *In re Boesch*, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as filled groove is used as already suggested by the Prior Art.

10. Regarding claim 3, Jeong shows most aspects of the instant invention including a non-planar bottom surface having an aspect ratio (i.e. depth to width ratio). Jeong does not disclose the specific the depth to width ratio. Jeng discloses that the aspect ratio of electrical interconnections is subject to optimization. According to Jeng, high aspect ratios make more difficult the size reduction of semiconductor devices. Therefore, it is desirable to minimize the aspect ratios of the multilevel contacts holes during the downscaling of the minimum feature sizes of the devices (col. 1/lls. 9-67 and col. 2/lls. 1-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize the depth to width ratio and/or to optimize the aspect

ratio of the grooves disclosed by Jeong in order to effectively reduce the overall device size as suggested by Jeng. With regards to the specific aspect ratio claimed by applicant, i.e., a ratio of depth to width of not more than 0.35, is only considered to be the "optimum" depth to width ratio of the opening disclosed by the Prior Art that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, size reduction, manufacturing costs, etc. (see *In re Boesch*, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as filled groove is used as already suggested by the Prior Art.

11. Regarding claim 4, Jeong shows most aspects of the instant invention including a non-planar bottom surface having concave portion 60 with a groove shape. Also, the concave portion has an aspect ratio (i.e. depth to width ratio). Jeong does not disclose the specific the depth to width ratio. Jeng discloses that the aspect ratio of electrical interconnections is subject to optimization. According to Jeng, high aspect ratios make more difficult the size reduction of semiconductor devices. Therefore, it is desirable to minimize the aspect ratios of the multilevel contacts holes during the downscaling of the minimum feature sizes of the devices (col. 1/lls. 9-67 and col. 2/lls. 1-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize the depth to width ratio and/or to optimize the aspect ratio of the grooves disclosed by Jeong in order to effectively reduce the overall device size as suggested by Jeng. With regards to the specific aspect ratio claimed by applicant, i.e., a ratio of

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depth to width greater than 0.35, is only considered to be the "optimum" depth to width ratio of the opening disclosed by the Prior Art that a person having ordinary skill in the art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, size reduction, manufacturing costs, etc. (see *In re Boesch*, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as filled groove is used as already suggested by the Prior Art.

12. Regarding claim 5, Jeong shows most aspects of the instant invention including a non-planar bottom surface having concave portion 60 with a groove shape. Also, the concave portion has an aspect ratio (i.e. depth to width ratio). Jeong does not disclose the specific the depth to width ratio. Jeng discloses that the aspect ratio of electrical interconnections is subject to optimization. According to Jeng, high aspect ratios make more difficult the size reduction of semiconductor devices. Therefore, it is desirable to minimize the aspect ratios of the multilevel contacts holes during the downscaling of the minimum feature sizes of the devices (col. 1/lls. 9-67 and col. 2/lls. 1-36). It would have been obvious to one of ordinary skill in the art at the time the invention was made to minimize the depth to width ratio and/or to optimize the aspect ratio of the grooves disclosed by Jeong in order to effectively reduce the overall device size as suggested by Jeng. With regards to the specific aspect ratio claimed by applicant, i.e., a ratio of depth to width greater than 0.7, is only considered to be the "optimum" depth to width ratio of the opening disclosed by the Prior Art that a person having ordinary skill in the

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art would have been able to determine using routine experimentation based, among other things, on the desired accuracy, size reduction, manufacturing costs, etc. (see *In re Boesch*, 205 USPQ 215 (CCPA 1980)), and since neither non-obvious nor unexpected results, i.e., results which are different in kind and not in degree from the results of the prior art, will be obtained as long as filled groove is used as already suggested by the Prior Art.

Conclusion

13. Papers related to this application may be submitted directly to Art Unit 2826 by facsimile transmission. Papers should be faxed to Art Unit 2826 via the Art Unit 2826 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2826 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2826 Fax Center is to be used only for papers related to Art Unit 2826 applications.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Leonardo Andújar** at **(703) 308-0080** and between the hours of 9:00 AM to 7:30 PM (Eastern Standard Time) Monday through Thursday or by e-mail via Leonardo.Andujar@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn, can be reached on (703) 308-6601.

15. Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 305-3900**.

16. The following list is the Examiner's field of search for the present Office Action:

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Field of Search	Date
U.S. Class / Subclass (es): 257/502, 758, 773 and 775	12/02
Other Documentation:	
Electronic Database(s): East (USPAT, US PGPUB, JPO, EPO, Derwent, IBM TDB)	12/02

Leonardo Andújar

Patent Examiner Art Unit 2826

LA

12/3/02

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